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(11) Publication number : 2000-102073

(43) Date of publication of application : 07.04.2000

(51)Int.Cl. H04Q 7/38  
H04M 3/00  
H04M 11/00

(21) Application number : 10-267843

(71)Applicant : KENWOOD CORP

(22) Date of filing : 22.09.1998

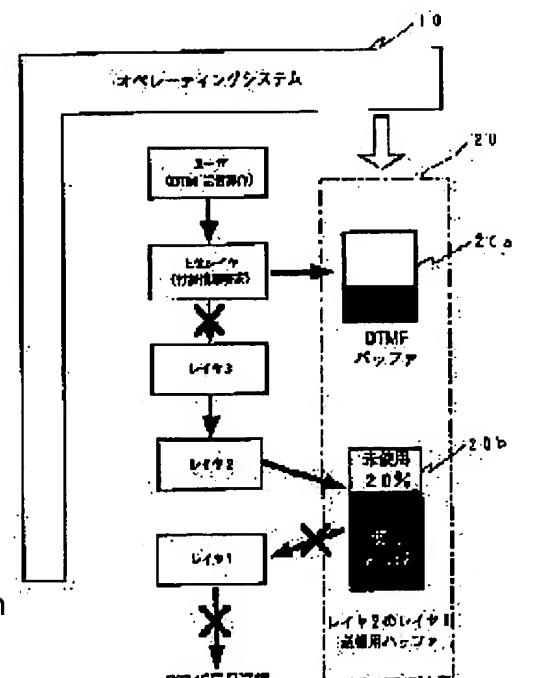
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(54) TRANSMISSION DATA CONTROL METHOD IN MOBILE OBJECT COMMUNICATION TERMINAL

(57) Abstract:

**PROBLEM TO BE SOLVED:** To provide a transmission data control method in a mobile object communication terminal capable of sending signals by a DTMF(dual tone multi frequency) transmission operation performed by a user without abandoning them even in the case that electric field strength with a network side becomes weak and a state incapable of transmitting DTMF signals is attained.

SOLUTION: When a radio link with a base station becomes a weak electric field, signal transmission cannot be performed in a layer 1 and delivery confirmation cannot be performed in the layer 2, the transmission message of DTMF inputted by the user is stored in a buffer 20b for layer 1 transmission. As a result, when the using capacity of the buffer 20b for the layer 1 transmission exceeds 80%, an operating system 10 notifies a high-order layer that a memory residual amount becomes equal to or less than a prescribed capacity by an event flag. At the time of receiving the event flag, the high-order layer stores data key inputted by the user in a DTMF buffer 20a by a first-in-first-out system (FIFO) by the DTMF signals.



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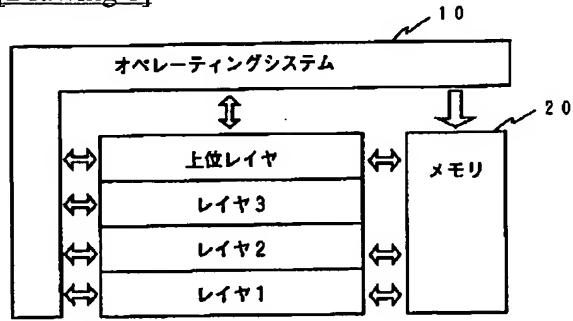
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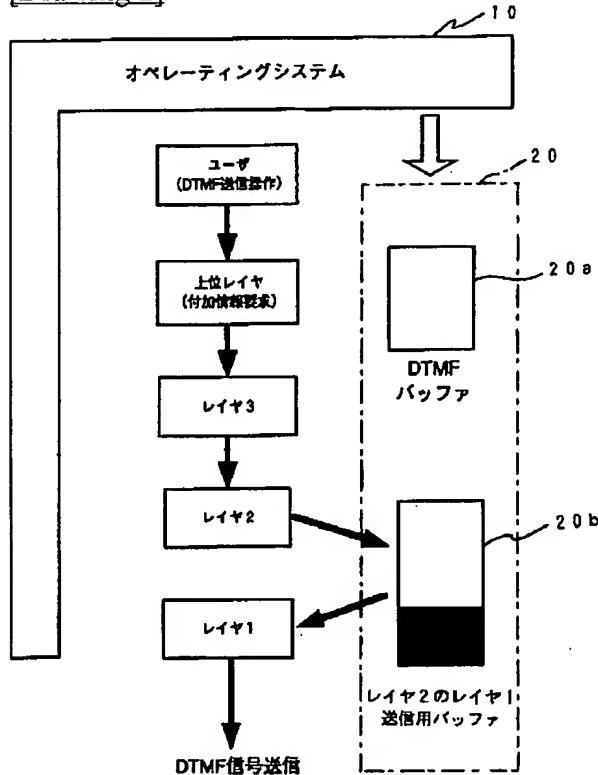
DRAWINGS

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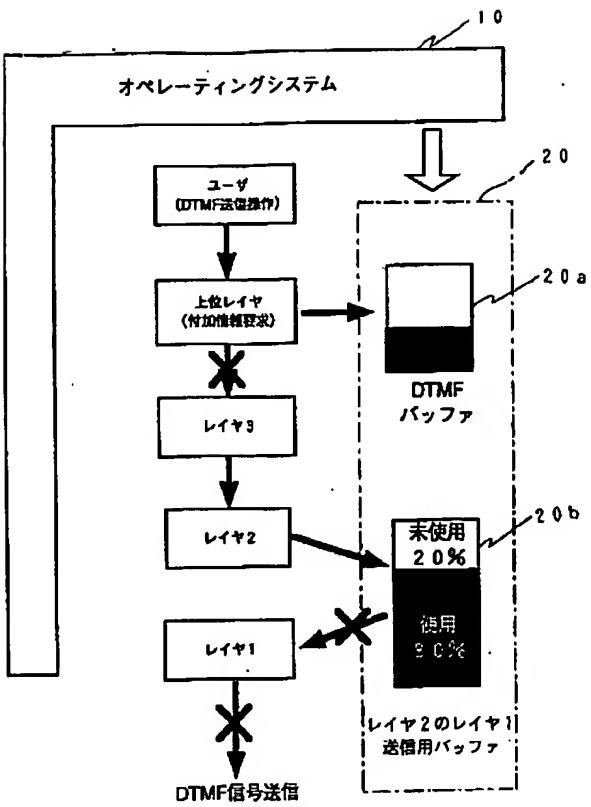
[Drawing 1]



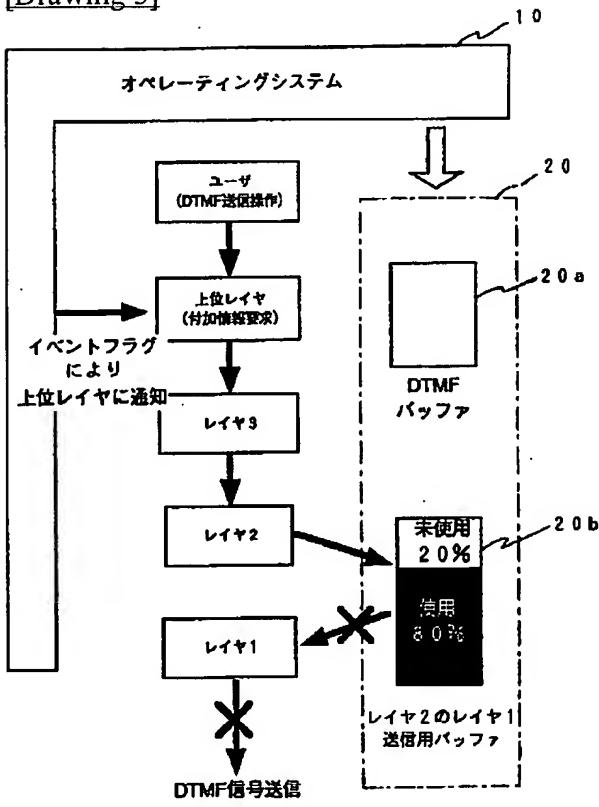
[Drawing 2]



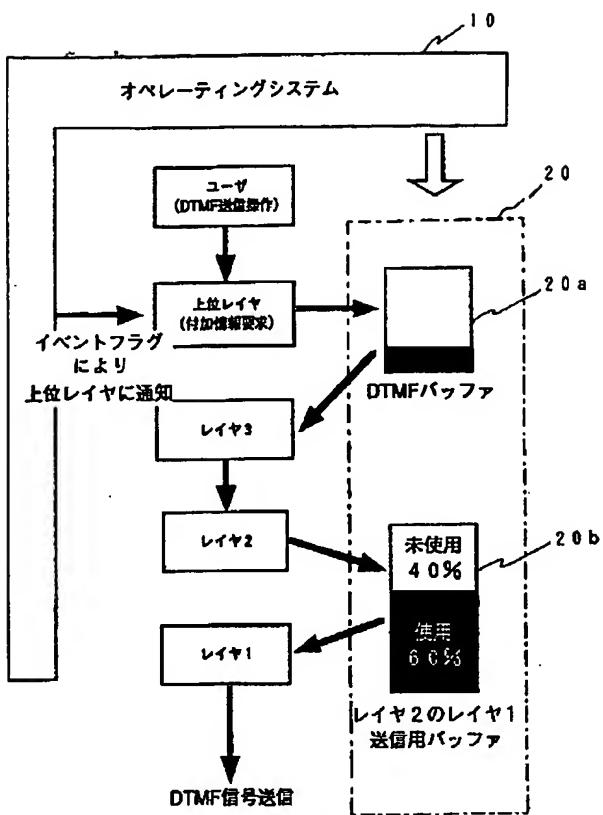
[Drawing 4]



[Drawing 3]



[Drawing 5]



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the transmit data control approach in a mobile telecom terminal and the mobile telecom terminal which can use as transmit data the data which it more specifically keyed, and can send them to the other party.

[0002]

[Description of the Prior Art] For example, PDC (Personal Digital Cellular) The thing equipped with the function which makes a DTMF signal the alphabetic character message which it keyed, and can be transmitted to an other party terminal is in a mobile telecom terminal [ like ]. In the cellular-phone system of such PDC, when transmitting the alphabetic character message by the DTMF signal etc. to an other party terminal, it is transmitted to a network side as an additional information message. If DTMF transmitting actuation by the user is performed and the additional information demand by key input specifically occurs, a high order layer will create the outgoing message of the DTMF transmission in the inputted alphabetic character, and will perform a DTMF Request to Send by additional information demand to a layer 3.

[0003] A layer 3 will send the received outgoing message to a layer 2, if this additional information demand is received. A layer 2 stores the outgoing message which received in the buffer for layer 1 transmission of a layer 2. The outgoing message stored in the buffer for layer 1 transmission is transmitted to an other party terminal through the base station by the side of the network connected in the radio link. If an outgoing message is received, the contents will be analyzed and it will express to a display as an other party terminal. In addition, the high order layer, the layer 3, and the layer 2 are managed by the operating system of PDC.

[0004]

[Problem(s) to be Solved by the Invention] However, in PDC, even if an additional information message like DTMF data transmission among the call control messages which are layer 3 messages transmits a message to a network, it may not transmit the acknowledgement message to a layer 3 from a network.

[0005] Although it can judge whether there is any response from a network side like the message about call controls, such as cutting controlled by the layer 3, using a timer if the response from a network side is specified beforehand, in the case of an additional information message, such a judgment cannot be made exactly. Therefore, in the high order layer, when a DTMF Request to Send was performed by additional information demand, it had to be judged that this additional information was normally transmitted to the network side from the layer 2.

[0006] Moreover, if a radio link with a base station becomes a weak-electric-current community, even if it transmits additional information to a network side, the confirmation of receipt of whether data reached the network side on layer 2 level may be unable to be performed. In a layer 2, unless the confirmation of receipt is made, the following message cannot be transmitted. For this reason, when the confirmation of receipt cannot be performed by the layer 2 at the time of a weak-electric-current community, a user performs DTMF transmitting actuation and additional information of a DTMF Request to Send is continuously performed from a high order layer, it will continue being accumulated in the buffer for layer 1 transmission of a layer 2, without processing an outgoing message.

[0007] Since the outgoing message which becomes a weak-electric-current community and is accumulated in the buffer for layer 1 transmission of a layer 2 is assembled, it needs much memory space. Since memory is limited, it can accumulate only a predetermined message in the buffer for layer 1 transmission of a layer 2.

[0008] Therefore, when the message from a high order layer is sent one after another, the processing as a set not only becomes heavy, but the outgoing message beyond the memory space of the buffer for layer 1 transmission of a layer 2 will be discarded. Thus, with the conventional technique, when became a weak-electric-current community, it becomes impossible to have sent the outgoing message and the availability was lost to the buffer for layer 1 transmission, there was a problem that the outgoing message which must have keyed was discarded and it was not transmitted to an other party terminal.

[0009] If processing which regulates a key input is not carried out, it becomes impossible to cope with it, if an outgoing message is in the buffer for layer 1 transmission of a layer 2 at all and it is accumulated [ fixed ], in order to avoid such a situation. However, when such regulation processing is performed, operability falls remarkably -- it becomes impossible for a user to send the outgoing message which a key input becomes impossible suddenly and it is not only bewildered by actuation, but is related continuously etc..

[0010] Even when it changes into the condition that this invention solves the technical problem of such a conventional technique, the field strength by the side of a network becomes weak, and a DTMF signal cannot be transmitted, it aims at offering the transmit data control approach in the mobile telecom terminal excellent in the operability which can be sent without discarding the signal by the DTMF transmitting actuation which the user performed.

[0011]

[Means for Solving the Problem] If the additional information demand by key input occurs in the transmit data control approach in the mobile telecom terminal which sends the data which it keyed to the other party in order that this invention may solve an above-mentioned technical problem, an outgoing message will be created by the high order layer and an additional information demand will be performed to the 3rd low-ranking layer. And from the 2nd layer, the outgoing message by which this outgoing message was further accumulated in the buffer for transmission of the 2nd low-ranking layer from the 3rd layer, and was accumulated in this buffer for transmission is passed to the 1st low-ranking layer, and is transmitted towards the other party. If it will be in the condition that transmission to the other party cannot be performed, an outgoing message is accumulated in the buffer for transmission of the 2nd layer more than a predetermined capacity and the memory resources in this 2nd layer run short, the signal which the buffer of a high order layer keyed will be accumulated.

[0012] Moreover, if the additional information demand by key input occurs in the transmit data control approach in the mobile telecom terminal which sends the data which it keyed to the other party according to this invention, the outgoing message of DTMF will be created by the high order layer, and an additional information demand will be performed to the 3rd low-ranking layer. And from the 2nd layer, the outgoing message by which this outgoing message was further accumulated in the buffer for transmission of the 2nd low-ranking layer from the 3rd layer, and was accumulated in this buffer for transmission is passed to the 1st low-ranking layer, and is transmitted towards the other party. If it will be in the condition that transmission to the other party becomes impossible and the confirmation of receipt cannot be taken, the data which the buffer of a high order layer keyed will be stored.

[0013]

[Embodiment of the Invention] Next, with reference to an accompanying drawing, the gestalt of operation of the transmit data control approach in the mobile telecom terminal by this invention is explained to a detail. When drawing 1 is referred to, it is the conceptual diagram showing the gestalt of the operation when applying the transmit data control approach in the mobile telecom terminal by this invention to the cellular-phone system of PDC.

[0014] Setting to drawing 1 , an operating system 10 is basic software for managing and controlling the hardware and software of a cellular-phone system synthetically. That is, an operating system 10 supervises memory 20 and manages a busy condition while it controls a high order layer, a layer 3, a layer 2, and a layer 1.

[0015] To an additional information demand like DTMF data transmission which may transmit repeatedly, specifically, an operating system 10 checks the situation of the memory resource of this layer 2, when transmitting a message. And if the residue of the memory resource of a layer 2 becomes less than the amount decided beforehand, that will be notified to a high order layer by the event flag or the message, and it will control so that the residue of the memory resource of a layer 2 does not decrease any more.

[0016] A high order layer is a layer which processes the proper concerning the various functions of PDC, i.e., the service function with which a user is provided. If a user specifically performs the key stroke of the DTMF data transmission which carries out message sending to an other party terminal, a high order layer will understand the contents and will perform a DTMF Request to Send by additional information demand to a layer 3. That is, if the key stroke of DTMF data transmission is performed, a high order layer will create the message of DTMF data transmission by additional information demand, and will perform the Request to Send of additional information to a layer 3.

[0017] If lack of the memory resource of a layer 2 is notified to a high order layer from an operating system 10, it buffers the data which it keyed as a DTMF signal again. Specifically, a high order layer is stored in DTMF buffer 20a (refer to drawing 2 ) by making into a DTMF signal the data which it keyed, if the notice of the purport that the memory residue of buffer 20b for layer 1 transmission of a layer 2 (refer to drawing 2 ) mentioned later became 20% or less is received from an operating system 10. If buffering of the DTMF signal in such a high order layer is a single-engined DTMF signal, it can be managed with 1 byte (depending on the approach of buffering, it is 4 bits). Therefore, where a message is created, compared with the time of storing in the buffer of a layer 2, data can be saved efficiently.

[0018] The layers 3, the layers 2, and layers 1 other than a high order layer perform protocol processing of a user and a network interface. Moreover, in a layer 2 and a layer 1, the information from a high order layer or a layer 3 is identified as mere data, and is processed. That is, a layer 3 performs processing about the location registration of a setup of a

network connection, maintenance, a change, cutting and restoration, and PDC, and authentication. A layer 3 passes the message of the DTMF transmission created by the high order layer to a layer 2 again.

[0019] A layer 2 performs establishment processing of a channel link, error control at the time of a message retransmission, etc. In a layer 2, if the message of DTMF data transmission is passed from a high order layer, after accumulating this message in buffer 20b for layer 1 transmission of a layer 2 (refer to drawing 2 ), it will send to a layer 1.

[0020] In addition, in a layer 2, when the confirmation of receipt of the message sent to the layer 1 cannot be performed, the following message cannot be sent. therefore -- for example, when a radio link with a base station becomes a weak-electric-current community and it will be in the condition that DTMF signal transmission becomes impossible and the confirmation of receipt of a message cannot be performed, it will be accumulated in buffer 20for layer 1 transmission b of a layer 2, without eliminating the message of DTMF transmission.

[0021] A layer 1 is a layer which performs the assembly/disassembly of the data for carrying out the exchange with a network on a radio channel. A layer 1 will transmit this data to the base station connected in the radio link, if the data stored in buffer 20b for layer 1 transmission of a layer 2 (refer to drawing 2 ) are received.

[0022] Drawing 2 - drawing 5 are the sequence diagrams having shown processing until it sends to the other party by making it into an alphabetic character message, the transmit data control approach in a gestalt, i.e., the DTMF signal which it keyed, of the operation shown in drawing 1 . In addition, in drawing 2 - drawing 5 , DTMF buffer 20a and buffer 20b for layer 1 transmission are the same memory physically, and address administration is performed by the operating system 10 and they are distinguished logically.

[0023] The sequence 10, i.e., an operating system, when the DTMF signal which keyed drawing 2 by DTMF transmitting actuation is normally sent to the other party shows the sequence when [ which is allowances ] having judged that it is to buffer 20b for layer 1 transmission of a layer 2. If DTMF transmitting actuation is performed by the user in this condition and a high order layer detects this key stroke, a high order layer will create the message of DTMF transmission by additional information demand, and will perform the Request to Send of additional information to a layer 3. A layer 3 will pass this message to a layer 2, if the created DTMF outgoing message is received.

[0024] A layer 2 will accumulate this message in buffer 20b for layer 1 transmission of a layer 2, if a message is received. And a layer 2 will be passed to a layer 1 in the sequence that the message which has carried out sequential are recording was accumulated, if the confirmation of receipt is performed. In a layer 1, if a message is received, signal transmission will be performed to the base station which assembles this message and is connected in the radio link.

[0025] A radio link with a base station becomes a weak-electric-current community, it becomes impossible for drawing 3 to perform signal transmission by the layer 1, and the sequence when it becomes impossible carrying out the confirmation of receipt by the layer 2 as a result is shown. When it becomes impossible to perform the confirmation of receipt of a signal which transmitted by the layer 2, it becomes impossible for a layer 2 to send the outgoing message accumulated in buffer 20b for layer 1 transmission to a layer 1. If DTMF transmitting actuation is performed by the user in such a condition, the outgoing message of the DTMF signal which the user keyed will be accumulated in buffer 20b for layer 1 transmission, without being sent.

[0026] Consequently, if an outgoing message is accumulated and an operating capacity of buffer 20b for layer 1 transmission exceeds 80% of the whole capacity, an operating system 10 will notify having become below a capacity predetermined in the memory residue of buffer 20b for layer 1 transmission to a high order layer with an event flag. In addition, although the notice of the memory residue having turned into below a predetermined capacity is given an event flag with the gestalt of this operation, it is not limited to especially this and you may notify by other approaches, such as a message.

[0027] Drawing 4 is a sequence which shows the actuation after a high order layer receives the notice of the event flag shown in drawing 3 . If the event flag which shows that the memory residue of buffer 20b for layer 1 transmission turned into below a predetermined capacity is received, a high order layer is a DTMF signal and stores in DTMF buffer 20a the data which the user keyed with FIFO (FIFO).

[0028] Thus, if a high order layer receives the event flag of the purport whose allowances were lost from the operating system 10 in the memory resource of buffer 20b for layer 1 transmission, a high order layer will not perform the Request to Send of the additional information about a DTMF outgoing message to a layer 3. Therefore, if allowances are lost in the memory resource of buffer 20b, even if DTMF transmitting actuation is performed by the user, the outgoing message of new DTMF will not be accumulated in buffer 20b for layer 1 transmission.

[0029] Drawing 5 is a sequence which shows actuation when the field strength of a radio link with a base station changes into the condition that a communication link can be performed from a weak-electric-current community. If wireless field strength is recovered in the usual condition, a layer 2 can perform the confirmation of receipt of the outgoing message accumulated in buffer 20b for layer 1 transmission. Since a layer 2 eliminates the outgoing message which was able to carry out the confirmation of receipt from buffer 20for layer 1 transmission b, the memory resource of buffer 20b for transmission is recovered gradually.

[0030] If the memory resource of buffer 20b for transmission is recovered gradually and an operating capacity of buffer 20b for layer 1 transmission becomes 60% or less, an operating system 10 will notify the purport which the memory resource of buffer 20b for transmission recovered to the high order layer with an event flag. Thus, an operating system 10 notifies the purport which the memory resource recovered with an event flag, when it becomes many memory residues from the memory residue when judging lack of a memory resource.

[0031] A high order layer will transmit a DTMF signal to a layer 3 by additional information demand, if the notice of this event flag is received. At this time, divide a DTMF signal, and it is not transmitted for every DTMF signal, but the DTMF signal to the maximum number which can be sent by one message is sent. Moreover, at this time, when the DTMF signal accumulated by the high order layer cannot send by one additional information demand, since information length was decided beforehand, it divides into multiple times and an additional information demand is performed.

[0032] In addition, when dividing and transmitting, two or more additional information demands may be performed at once. Moreover, a timer is formed and one additional information demand is transmitted, and a timer is started and you may make it transmit the following DTMF signal by timer expiration. Moreover, when a DTMF Request to Send is newly performed by actuation of a user while accumulating the DTMF signal in the high order layer even if the memory resource of buffer 20b for layer 1 transmission of a layer 2 is recovered, a DTMF signal is buffered in DTMF buffer 20a.

[0033] As mentioned above, even if a user performs DTMF transmitting actuation according to the gestalt of this operation when a DTMF outgoing message cannot be transmitted to a network side by a weak-electric-current community etc. as explained to the detail, it is not said that the message which the message is accumulated in buffer 20b for layer 1 transmission of a layer 2, and was finally inputted is discarded.

[0034] Moreover, according to the gestalt of this operation, if the memory resources of buffer 20b for layer 1 transmission run short, the contents of the DTMF transmitting actuation which the user performed will be accumulated in a DTMF buffer by the DTMF signal. Therefore, the data of the DTMF transmitting actuation which the user performed can be stored efficiently. Furthermore, since the DTMF signal accumulated by one message or the number message can be transmitted by 1 time thru/or several additional information demands when the memory resource in buffer 20b for layer 1 transmission of a layer 2 is recovered, processing is mitigable.

[0035] In addition, although [ the gestalt of this operation ] transmitting processing of a DTMF signal is changed according to the condition of a memory resource, especially this invention is not limited to this and transmitting processing of a DTMF signal may be changed by the ability of the confirmation of receipt to have been performed by the layer 2. Moreover, although the example sent to an other party terminal explained the message by the DTMF signal with the gestalt of this operation, especially this invention is not limited to this and, also in the case of the DTMF signal sent out at the time of the message of a housesitting service center and a house answering machine, or various kinds of reservation, of course, can be applied. Furthermore, with the gestalt of this operation, although PDC was explained to the example, especially this invention is not limited to PDC and can be applied to the mobile telecom terminal which performs same processing.

[0036]

[Effect of the Invention] Thus, even when the field strength by the side of a network changes into the condition that it becomes weak and a DTMF signal cannot be transmitted according to the transmit data control approach in the mobile telecom terminal of this invention, it becomes possible to send without discarding the signal by the DTMF transmitting actuation which the user performed.

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